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PRIORITY CRITERIA IN PROJECT EVALUATION.

(Presented by the Government of
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PRIORITY CRITERIA IN PROJECT EVALUATION

This paper is concerned with the investigation of factors and techniques proposed for establishing priorities of new industrial projects in planning and execution, with special emphasis on priority considerations for developing countries.

Priority factors are first classified, in accordance with their nature, and priority systems are thereafter examined.

It is concluded that, for industrially developing countries, straight ranking of benefits would be more suitable than ranking by benefit ratios, and that priority factors bearing on foreign relations for developing countries may well play a most significant role in project selection for execution.

INTRODUCTION

An ambitious industrial plan would comprise quite a number of projects having varying features and parameters, a situation which calls for the development of some practical method of selection, from the projects proposed for the industrial plan, of those projects most deserving priority for final evaluation and execution.

An attempt to classify priority factors is herein presented, with particular emphasis placed on those factors mainly pertaining to industrially developing countries as distinct from conventional priority criteria.

Determination of basic financial benefit factors must be based on net improvement, in the light of anticipated conditions in relation to present or previous conditions to be replaced. In case a new industry is established (i.e. an industry which did not exist before), the problem is that of carefully studying of the new project and comparing it with previous import conditions. Should, on the other hand, an extension or an introduction of new processes, operations and machines be involved, the study must deal with both new and existing conditions, in an endeavour to arrive at net benefit or improvement in the plant under consideration.

Improved project analysis is deemed to develop and encourage competition between industrial concerns as regards allocation and utilization of available investment funds. It also provides those responsible for planning and execution with effective means, for rational priority rating through selection of the most promising and most timely projects from the variety of projects proposed.

NOMENCLATURE

Basic Economic Criteria:

I: Net capital investment

R: Net return or profit (financial benefit) per year

N: Net national income (resulting from new product)

F: Foreign exchange benefit (i.e. value of products consumed locally, which would otherwise be imported, plus value of products estimated for exportation)

D: Annual depreciation

R/I: Profitability ratio (i.e. ratio of net return to capital investment)

N/I: Ratio of national income benefit to capital investment

F/I: Ratio of foreign exchange benefit to capital investment

$\frac{I}{R + D}$: Number of years to repay

Co-efficients for usage of domestic resources:

V: Total value of product

M_i: Value of imported raw materials, components and supplies

M_d: Value of domestic (local) raw materials, components and supplies

W: Cost of local labour employed in production

P: Cost of motive power consumed in production

M_i/V: Imported material co-efficient

M_d/V: Domestic material co-efficient

W/V: Labour co-efficient

P/V: Power co-efficient

Classification of Priority Factors

Priority factors may be classified, in accordance with their nature, into four main groups, namely:

(a) Strategical Factors:

These refer to considerations deemed of primary importance to the industry, e.g. production of basic engineering materials and standardized products. These strategical factors comprise:

(1) Strategical importance to industrial set up.

(2) Relative importance in clearing obstacles facing existing industries.

(3) Timing requirements for inter-related projects.

(b) Economic Factors:

These place emphasis on the effective use of financial resources in producing benefits with a view to improving the economical status of the country. These priority factors include:

(4) Profitability or net return on capital investment, R.

(5) Improvement in national income, N.

(6) Savings in foreign exchange (i.e. improvement in balance of payments position in foreign exchange), F.

(7) Relative size of individual projects, as measured by the amount of their benefits.

(8) Immediacy (or otherwise deferment) of financial return (for fit into the economy).

(c) Availability Factors:

These factors, though intangible and subject to judgement, may have a decisive influence on project evaluation. They include:

(9) Availability/Usage of local raw materials (M_d/V) such as iron ore, cotton, vegetables, etc., the degree of the availability assuming one of several forms, viz.:

(i) Materials available in both quantity and quality;

(ii) Materials available in quantity, but not in quality;

(iii) Materials available in quality though quantity has to be increased;

(iv) Materials shall be available on completion of some other projects;

(v) Materials available, but quantity has to be supplemented by importation (M_i/V).

(10) Availability/Employment of manpower (W/V). The degree of availability of skilled and/or unskilled personnel varies in accordance with the nature of industry and technical capacity of the country; it takes one of the following forms:

(i) Manpower available in both number and skills needed;

(ii) Manpower available in number, though specific skills have to be developed,

(iii) Number has to be increased by development of skills;

(iv) Local manpower has to be supported by experts brought in for specific lengths of time.

(11) Availability of Motive Power (P/V). This includes the availability of fuel such as petroleum products, coal and uranium, also the availability of water falls for power generation. (A striking example in the UAR of the influence of the availability of motive power on project evaluation is the rapid development of Aswan into an industrial town, on account of the availability of electric power on completion of the High Dam project).

(12) Availability of Transportation. Facilities, such as rail, road and river transport, also the existence of harbours.

(13) Availability of Domestic/Export Markets, which factor is most significant in deciding on the initiation and extent of the particular industry.

The assurance of existing and/or prospected markets is affected by various considerations which include:

For Domestic Markets:

(i) Production of goods being so far imported;

(ii) Expansion of existing industries;

(iii) Creation of new industries.

For Export Markets:

(i) Expansion of volume of present exports;

(ii) Improving and/or advancing quantity and utility of exported articles;

(iii) Processing imported goods for re-exportation;

(iv) Processing available materials not yet being exported.

(14) Availability of local faculties for design and creative work.

Priority may be given to certain industrial projects for which experiences and capacity for creative work are available. To name but a few of those industries calling for special creative talents such as toy industries, and those bearing on artistic abilities such as ornamental industries. A further example would be the watch-making industry which depends on specific experiences and abilities.

On execution of an industrial plan, factors other than those given above have to be taken into consideration, particularly in as far as industrially developing countries are concerned. These additional factors may be grouped as follows:

(d) Factors relating to Foreign Relations:

These comprise three factors, namely:

(15) Availability of foreign exchange for investment and running of project (in case materials, supplies and experiences continue to be imported after execution and putting into operation of the project).

(16) Availability of financial facilities. Facilities offered by governments, concerns and individuals would, no doubt, be a prime factor in the selection of project for execution.

(17) Availability and interest of foreign concerns for co-operation. Particular interest in certain industrial projects as shown by co-operating concerns would be quite decisive in priority measures for project execution.

It is worthy to point out that this group of factors bearing on foreign relations may well impose serious deviations from priority ranking based on conventional priority factors. This is particularly true for the case of industrially-developing countries, for which decisions taken are mainly based on judgement, rather than on mathematical manifestations of priority criteria.

PRIORITY RATING SYSTEMS

For the ranking procedure, of priorities, two basic systems are available, namely:

I. Straight Ranking of Benefits:

This is the simpler of the two rating systems under consideration, in which benefits appear of equal weight in and have equal influence on the final rating of the project. The system, by virtue of its simple nature, is particularly suited for the analysis of projects with data imperfections, and may thus be convenient for adoption by developing countries.

II. Ranking by Benefit Ratios:

In this more complex system, benefits are formulated in terms of ratios which are then added into a single rating factor. This system is bound to be based on fairly accurate data of the project, a case favouring advanced industrial planning.

Benefit ratios may be found quite effective in emphasizing differences between benefits and in carrying them directly into the final rating. Basic benefit ratios used in this system include:

(i) Ratio of Profitability to capital investment, (R/I);

(ii) Ratio of National Income benefit to capital investment, (N/I); and

(iii) Ratio of Foreign Exchange benefit to capital investment, (F/I).

A final benefit rating factor, based on the above-mentioned benefit ratios, may be put into the integrated form $(R + N + F)/I$.)

This factor may further be adjusted to its present value, on the fourth priority factor of the number of years required for the complete execution of the project (at 10 per cent compounded annually). Adjusted values may then be used for priority ranking of projects within the same group of industries.

Should the influence of domestic raw materials usage (viz. M_d/I) be taken into consideration, the following effects would result:

(a) Tendency to weaken comparison of final benefit rating factors between projects in different industries, owing to the fact that the factor (M_d/I) is rather of a characteristic nature, i.e. in as much as low- or high-cost material is involved in the industry concerned.

(b) Distortion of the ratio of national income benefit to capital investment, as the inclusion of raw material factor would let the value of national income benefit approximate net sales instead.

(c) Introduction of the factor (M_d/I) does not display a factor so statistically refined as the three basic economic factors given above.

Adjustment for size of project would nullify the purpose of ratio analysis, since it would upset the measure of relative effectiveness of projects in their use of capital in the attainment of desirable benefits (irrespective of project size).

It is worthy to point out that a wider range of priority factors for project evaluation would be desirable; this necessitates, however, rather refined project analysis data, which may not be readily available, especially in industrially developing countries.

For final evaluation of project priority, the relative value, per final unit of product, of materials and supplies (M_i/V and M_d/V), wages of local labour employed (W/V) and cost of motive power consumed (P/V) would furnish co-efficients and measures of only limited usefulness for comparison between projects. This is due to the fact that such co-efficients may quite widely vary from industry to industry in accordance with the nature of product and processes involved.

DISCUSSION OF PRIORITY RATING SYSTEMS

In this paper, the two basic systems of priority ranking have been investigated and evaluated in the light of the extent of their applicability to developing countries.

As priority factors, however, are diversified in nature and measure, it seems that a relevant rigourous mathematical handling of the problem would hardly be of any significant practical feasibility. This lack of accurate and reliable priority rating would, as yet, leave the door open to expert judgement, estimation and arbitrary weighing.

In this respect, it is worthy to quote from the presidential address presenting the 1963-1967 Five-Year Socio-Economic Plan in the Philippines, concerning the declining importance of mathematical priority formulae:

> "Reliance on mathematical formulae for priorities in industrial projects does not assure successful economic planning."

Developing countries may be recommended not to place much emphasis on mathematical formulation of priority criteria, but rather to have projects and planning integrated with over-all objectives, these may include:

(a) Direction of available resources to most productive uses;

(b) Conservation of foreign exchange;

(c) Maximum utilization of domestic materials, man and motive power;

(d) Promotion of national income and economic growth.

Of particular interest to developing countries, especially for project selection for execution, are priority factors connected with foreign relations, namely the availability of foreign exchange, financial facilities and interest of co-operating concerns. These factors may well prove most decisive in project evaluation. Second in importance to these priority factors, are the economic factors, viz. net return on capital investment, improvement in national income and savings in foreign expenditure.

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SOME ASPECTS OF PROJECT IMPLEMENTATION,

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SOME ASPECTS OF PROJECT IMPLEMENTATION

Once an industrial project is decided upon, and its advantages are analysed, technically and economically, and the authorities decide to go on executing that project, certain successive steps must be taken so as to link the decision phase to the production phase. All these steps fall under the title "Implementation" of the project. It is in this area of implementation that developing countries need much experience. The present paper aims at throwing some light on some aspects of implementation of industrial projects. Reference is made to particular problems which the UAR encountered and how it managed to solve them, and also to more general problems which face developing countries in executing any industrial project. It is not intended to cover problems of implementation, a target which is wider and more diversified than the scope of this paper. It only deals with some aspects - technical, financial and social - which may be of particular importance, namely:

I. Asking for Offers from Contractors to Execute the Project

II. Comparison between offers and choice of the best offer

III. Drawing up a Contract

IV. Scheduling and Programming

V. Problems related to Personnel

VI. Problems related to Financing

VII. Control and Reporting

I. Asking for Offers from Contractors to Execute the Project

The first step in the implementation phase is to decide clearly and profoundly what is needed and who is to carry out the different components of the project. Developing countries are confronted by choosing between two alternatives:

(a) To give the whole project to a contractor, either a single contractor or a consortium of more than one contractor, who will be assigned for the complete execution of the project as a turn-key job. Under such a case the contractor shall carry out the civil engineering, delivery of machinery and equipment, all engineering services, erection of machinery and equipment start-up and commissioning of the plant. This alternative is, of course, the easy one and is chosen if the country concerned does not feel it can carry out by itself a part or another in the execution of the project. Nevertheless, this alternative is also the most expensive and it must not be reverted to unless conditions impose that. The UAR used this system in very few cases, but it does not adopt that system anymore.

(b) To give the contractor part of the job. This part generally includes licence and know-how, if any, design and engineering of machinery and equipment, delivery of the same including spare parts. It includes also technical services in erection and start up of the plant. It may also include assistance in management of the plant for a certain period of time, as well as training of local personnel abroad. This alternative is decided upon if the country concerned is in a position to carry out by itself a part of the work. The UAR, for instance, is generally capable of carrying out all civil works and so the role of the contractor here is to provide the basic data sufficient enough so that the civil local contractor for execution of civil works can work out all the design and

and computations necessary for the execution of this part of the project. The UAR is also generally capable to carry out the erection of the machines and the start-up of the plant, but it needs supervision by the contractor's personnel.

Whatever the case may be, it is most imperative to analyse the steps to be taken before undertaking any step, to decide what can be done locally and what is needed from abroad.

On the basis of such decision some offers or tenders are asked for in order to be sure to get the best services with the best terms.

The preparation of this call for offers is perhaps a decisive factor in arriving at clear terms of contracting and in evading endless problems in execution. It must be put as clear as possible and it must define the scope of services needed. Whatever the degree of detailing included in this call for offers, it must include all items which would enable the tenderer to submit his offer for tender, in particular the following elements:

(a) Raw material or materials used in the production, their analysis and characteristics;

(b) Type of final product or products needed, their analysis and characteristics;

(c) Site chosen for the installation, showing the area of the plant, proximity to means of transport, availability of power and water, proposed means for effluent disposal etc., climatic conditions need after to be stated;

(d) Defining the obligations of the purchaser and of the contractor and stating the service needed from the contractor in a very clear way;

(e) General conditions of contracting which are accepted by the purchaser;

(f) As to the machinery and equipment needed, the call for offer may include detailed specifications drawn by technical experts,

local or from abroad. This is the job of the consultant engineer and the UAR in many cases hired engineering offices to draw the detailed specifications on the basis of which offers are presented. This procedure is, of course, useful in so far as it defines what is needed so that a comparison between different offers is rendered quite easy. This procedure is reverted to when there is not much room for getting proposals for different processes and different machinery as a result thereof. Sometimes it proves more useful and beneficial to define the plant needed in a general manner so as to leave a wide degree of freedom for tenderers to submit what they think more appropriate. This alternative, advantageous as it is for getting different proposals, entails too much work and estimations in comparing different offers,

Now, and after defining what is needed, there are different procedures for getting bids and offers:

1. One can get an offer for delivery of one machine or more in the form of proforma invoice. In such a case of simple machinery, a direct order is often passed after seeing through the technical characteristics of such machinery as well as the price.

2. For more complicated works, for example, a complete plant, one usually gets a complete offer with detailed flow-diagrams and material balances, etc. In such cases one may use different systems viz. general adjudication or limited adjudication restricted to known and reputed firms.

The first step in executing the industrial project is, thus, deciding on what is needed and preparing the call for tender and obtaining one or several offers.

II. Comparison between offers and choice of the best offer

In comparing different offers there are many factors to be considered:

1. Past experience of the tenderer

Considering the competency of all the tenderers and their actual capacity of undertaking a given job, and the number of similar plants constructed by each may be a good starting point in evaluating the different offers. Developing countries cannot afford to be a field of experimentation. Tenders presented by firms of insufficient capacity must be excluded irrespective of the prices offered.

2. Process choice and technical acceptability of offer

The second step is to study thoroughly the technical side of the offer, disconsidering for the time being its financial side. Well-reputed firms may propose certain processes which are divorced from local conditions in the country in which the project is to be realized. Different processes offered must be, thus screened, to ensure their adaptation to local raw materials and to all other local conditions. Any offer which includes an unacceptable process or technique must be either discarded or modified before it is taken into consideration. Comparisons along the coming lines must be limited to technically-accepted offers.

3. Unifying the scope of services

Any comparison between the prices of different offers means nothing unless the scope of services in the different offers is unified.

Some tenderers include, for instance, the fees for the design and engineering of the machinery and equipment in the price of this machinery and equipment. Others, however, declare separate fees for this design and engineering. This must be taken into consideration. The price of machinery and equipment may be given f.o.b., c.i.f. or f.a.s.; it must also be unified. The scope of offered machinery and equipment must be studied and if there is a section

or part missing in any, its price is added, such price being estimated or given later by the tenderer. The capacity of the different machinery must be checked to make sure that they fit into the general capacity of the plant. Storage capacity must also be unified.

Services must be unified, difficult though this may be, especially if they are limited in supervision of erection and start-up, because of the differences in the human element, past experience, skill, understanding of local conditions, degree of co-operation, etc. If such services are quoted for as an accumulated lump sum to be paid, irrespective of the number of technicians delegated, the comparison between sums quoted may be justified. In many cases, however, such services are quoted for on the basis of fees and allowances specified for every category of technician per day or per month of stay. In such a case it proves always to be very difficult to compare them even after unifying the number of technicians or their periods of stay or the number of man-month in all offers, because, once again, people differ in their capacities.

The same can be said, and even more so in the case of assistance in management which is not linked with commissioning of the plant but starts thereafter.

In many cases one is obliged to exclude the price of such technical assistance for the scope of comparison sufficing himself, in this area, to getting acceptable terms and acceptable numbers of technicians.

4. Production and consumption figures

The price of the machinery and equipment, even after unification, does not represent everything. Different processes, even after rejecting the unacceptable ores, still vary, in so far as they need different amounts of raw materials, power, steam, water, etc. and also in so far as the efficiency of production is concerned.

The problem of efficiency in production is accounted for by unifying the capacity of the required project and what remains is the extra expenses due to different parameters of consumptions. This difference may be of minor importance in certain cases, but may be of prime importance in others. Take, for instance, a rotary kiln for clinker production. The fuel consumption raises itself as one of the most important items on the basis of which a decision should be taken; in conjunction with all other factors. In complicated plants in the chemical industries as a rule such problems of consumption figures must be considered very seriously. But there are limits to the extent of such consideration. First, these figures must be guaranteed; second, the extent of giving an offer the merits for lower consumption may only cover the limit of penalty which the tenderer is ready to accept in case of non-fulfilment of such figures. In some cases, the UAR encountered offers in which very low consumption (lower than theoretical) figures are stated. In other cases there were all reasons to believe of the truth of low consumption figures, and full credit during the lifetime of the project may then be given.

Every case must, however, be studied on its own merits so as to decide to which extent the difference in consumption figures ought to be taken into consideration for choosing the most advantageous offer.

5. Other factors

There are many other factors which affect the final choice, but which are difficult to evaluate. The storage capacity for raw materials and final products must be matched, otherwise comparison between price of handling equipment cannot be comparable. Separate items like workshops, firefighting, effluent disposal system, water treatment, transformer station, boiler-house, laboratories, etc. must be either excluded from the comparison or included after unification. The quality is also of utmost importance and comparison cannot be considered fair unless comparative quality is considered.

Here we encounter material of construction, thickness of special equipment, types of motors, compressors and moving units.

Stand-by units should, generally, be included in the comparison.

Spare parts, however, represent a problem in the comparison as a result of the difference of scope. Their price can be fairly taken into consideration as part of the comparative over-all price, if the tenderers accept to guarantee adequacy of such spares for a certain period of time after the proper functioning of the plant, and state their readiness to deliver any extra needed spares needed during such a period free of charge. Sometimes a detailed list of spare parts is drawn up and tenderers are requested to quote on the basis of such before the price of spare parts is taken into the comparative figures.

Arriving at a fair degree of unification with respect to machinery and equipment is not always an easy job, but it nevertheless can be done with a fair degree of approximation.

The same does not supply often to technical services or the weight of the machinery and equipment. The delivered weight is a function of the process in a way and although generally more weight may be considered a sign of robust and massive machines, in some cases it may be considered as a disadvantage. For instance, in the nitric acid production, the old process of using multiple towers for absorption, which would naturally lead to delivering more weight, is a disadvantage compared to delivering the one-tower system, which is more advanced. To this must be added that the weights are generally indicative and not guaranteed except within certain limits.

Another factor may be the time of delivery. This factor may be a decisive one in some cases. In others, the difference in delivery time being limited, it is very difficult to evaluate such difference in terms of money. Nevertheless this factor cannot be completely ignored.

Another factor may be the different guarantees the tenderers are ready to give, and the relevant penalties he is ready to bear in case of non-fulfilment of the guarantees.

Still another factor may be the degree of acceptance of the tenderer to the general conditions of contracting, mention of the most important of which shall be done in Part III.

6. Financial evaluation of different offers

Comparison of prices of machinery and equipment after adjustment of the scope of delivery and scopes of services is very indicative, it is true, yet it is not at all sufficient to decide on the most beneficial offer. The offered terms of payment may play the decisive role in the choice.

Developing countries as a general rule, especially with respect to big projects, need financing facilities. The type of financing facility offered must be studied very carefully and relevant merits and demerits must be properly evaluated.

Although it is very clear that deferred payment entails accumulation of interest which must be paid, yet developing countries are obliged to take this path because of their wish to execute many projects on one hand and the non-availability of foreign currency to pay cash for all the projects on the other hand.

Offers may vary with respect to percentage to be paid as down payment, percentage to be paid as deferred payments. They may vary as well with respect to rate or rates of interest and the method and time of calculating that interest. Bank charges, financing charges and insurance charges may vary. All these differences must be accounted for in ways which would reflect the advantages and disadvantages for the standpoint of the purchaser.

To calculate all the financial obligations including interest which result from different offers in accordance with the terms given in each is not a fair approach and must eventually lead to exclusion of

that offer with the longest period of payment, the accumulated interest being logically the highest in that offer, which is really more advantageous to developing countries.

To carry out the calculations on the basis of a unified pattern for payment is a fairer approach but not good enough to reflect the advantages or disadvantages in each. It may lead to erroneous conclusions.

A more proper method to evaluate different offers from the financial point of view is to put down the actual flow of payments together with interests according to the amounts and dates stated in every offer and according to the rate or rates of interest given. This step is to be followed by calculating the present worth of all the sum to be paid using a fixed rate of interest or return, for all. This fixed rate varies of course from one country to another and depends rather on the availability of foreign currency and the actual rate of interest with which that country can have the amounts of foreign currency needed to execute all its projects. (For the UAR this rate may be taken as 7 per cent per annum) although lower rates of interest are generally declared in contracts. Comparing the present worth would give a good indication of the degree of preferability of one offer or another.

III. Drawing up a contract

This part will not deal with all items to be included in a drawn-up contract. It will only emphasize certain points of interest.

Before doing so there are some general remarks to be stated.

First of all, it must be clearly comprehended that signing a contract merely opens a phase of a long relation between the two sides concerned, a relation which must be based on mutual confidence and deep understanding of each others difficulties. This, of course, cannot take place unless the contract reflects, in a true sense, the interest and benefits of both parties, and is drawn up with all possible fairness and clearness. Any contract in the world being unable to foresee all possible future implications, must eventually leave a certain area of good will and objectiveness for future actions from both sides.

In the second place, the more clearly the obligations on both sides are stated, the more probable that future problems will be evaded. Phrases used must be clear cut with no future possible misinterpretations.

In the third place, the contract must cover all the rights of both parties during the whole period of its execution from the financial point of view as well as from the technical and executional point of view.

Bearing the above-mentioned points in mind, it may be useful to pass to some items which deserve mentioning. These items, which will be very briefly referred to, fall into three categories:

The first category is technical matters. It includes the following:

1. Object and scope of contract must be clearly stated.
2. Description of the plant may be more than useful as a separate item of the contract.
3. Specification of machinery and equipment, an Annex as it is to any contract, must be thoroughly studied. In this connexion problems always rise because of lack of details and may be, differences in opinions.

4. Scope of engineering works must be specifically mentioned not in general words but rather in detail so as to evade in the future who is to do what.

5. Mutual obligations of both parties during the whole period of execution of the contract must as well clearly define what the contractor shall not do.

6. Because it is impossible, while contracting, to consider all technical details which may not become clear except at the engineering phase, it is always useful to state in a separate item that all works which are not mentioned in the contract, but which are necessary for the safe, proper and efficient construction, operation and maintenance of the plant shall be executed by the contractor and shall be considered as included and covered by the contract price.

7. The contractor must give a guarantee of engineering design and bear the results of any fault for which he is responsible.

8. He must, as well, guarantee the quality of his machinery and equipment, and replace any defective ones.

9. The time of delivery must be guaranteed by the contractor and he must bear some penalty in case of delay.

10. An equally important guarantee to be given by the contractor is the guarantee of production capacity, quality of the products and consumption figures for raw materials, power, fuel, water, steam, etc. Such guarantees are always linked with penalties to be borne by the contractor in case of non-fulfilment.

A word must be said here concerning penalties. Developing countries are not indeed after getting penalties and indemnities. They are primarily interested in getting a good plant which produces a good quality product. Nevertheless, penalties in a contract is a must in order to ensure getting everything done well and in due time.

11. The time of completion of the plant and handing it over to the purchaser may also be guaranteed by the contractor provided, of course, that the purchaser fulfills all his obligations.

12. Non-fulfilment of the production consumption guarantees must have certain limits especially because the penalties to be borne by the contractor are often limited to a certain ceiling. It is very understandable, then, that the purchaser keeps for himself the right to reject the plant or a section thereof in case the non-fulfilment exceeds a certain limit of say 10 per cent less production or more consumption. Before rejection, anyhow, the contractor, on the other hand, must be given the chance to effect certain changes or replacements or modifications, at his expense, during a certain period of time to be agreed upon.

13. Inspection of machinery and equipment before they are shipped is a right which the purchaser must utilize. This right is often neglected and taken lightly. In most cases it proves that the money spent on inspection more than pays for itself.

14. Developing countries must try to get in any contract the widest possibility of training local personnel either in their native country or abroad, more of this point will come later.

15. The number of foreign personnel to erect the plant or supervise the erection as the case may be, and those to carry out the start-up or supervise the start up, must be clearly stated in the contract as well as their period of stay, leaving, still, the door open for augmenting these members or diminishing them in accordance with actual needs.

16. In many cases it proves that it is very useful to include in the contract an item related to assistance in management for a certain period of time. It is often very costly to make a management contract by itself, and it is very advisable to tie up this management to the handing over of the plant. A point worth

mentioning here is to insist that assistance in management should not begin except after handing over and fulfilment of all guarantees.

The second category of items to be included in a contract is financial matters, which include the following:

1. The price of the services carried out by the contractor must be stated together with any possible future variations. There are two types of variations, the first of which may be due to additional equipment which proves to be needed at later stages of execution. If this point is not covered in accordance with what was stated in point 6 of the technical category, extra price must be limited by a certain ceiling of 3 per cent, for instance. The second type of variation may be due to increase in price of materials or wages. Here an escalator clause is often inserted with a certain ceiling to its application.

2. The terms of payment must also be clearly stated. When to transfer the downpayment, what is the form of the letter of guarantee to be given against this payment, when to open the letter of credit for the payments against shipping, when to open the letters of guarantee for the deferred payments, what is the rate of interest per annum, what are the bank charges and insurance charges, etc., when is the interest going to be calculated. Often putting tables of payments alongside the dates on which these payments became due in the contract is very useful in evading future difficulties.

   Sometimes bills of exchange are given instead of letters of guarantee for the deferred payments as well as for the parts to be paid against shipment. These bills of exchange and dates for their payment must be linked with effecting the shipping and presentation of the needed documents. The invoice, shipping specifications and packing lists, the certificate of origin and the bill of lading.

3. Payments for the services of foreign personnel are generally paid through a revolving letter of credit which covers the period of stay of such personnel.

4. The contractor must, in any way, give a guarantee deposit as a pecuniary guarantee for the due execution of the contract, which is to be void after fulfilment of his guarantee obligations.

The third category of items to be included in a contract is concerned with general points which include the following:

1. Terms and conditions related to services of foreign personnel. The more clearly these terms are stated, the more problems can be evaded in the future.

2. Observation by the foreign personnel of the laws and regulations of the purchaser's country, must be stated in the contract in order to avoid legal breaches from their part.

3. In general, a cancellation clause, an arbitration clause, and a Force Majeure clause must be included in the contract.

IV. Scheduling and Programming

One of the frequent mistakes that tends to be made by a developing country is to set out over-optimistic schedules of execution. This all too often goes into contracts of supply of equipment. The result is unnecessarily long storage of equipment because buildings may not be ready, with the unnecessary hazards relating to such storage.

It is therefore very important that a realistic schedule of execution should be made as early as possible, based on existing local conditions. It is best for all the contracting parties concerned to be aware of such a schedule from the start.

However, the real time of execution can be considerably shortened if certain steps are undertaken from the time a decision is taken to proceed with a given project. A clear example in this respect is site selection, requisition and preparation. These steps can mostly be undertaken before contracting for equipment, and thus save valuable time. It is clear that civil engineering design, let alone execution, cannot start until a site is selected and the necessary soil investigations carried out. Moreover, in many cases, equipment design has to be altered due to specific characteristics of the site. It is considered wise even to carry out earth-filling operations, to prepare internal roads in the site, to build fences, to arrange for power and water supply for construction and erection at a very early stage of project implementation, even before contracting for equipment.

Civil engineering is always a bottleneck in project implementation in developing countries. The easiest way of overcoming this is by contracting for the whole project on a turnkey basis including civil engineering. Although this was touched upon earlier in this paper, it will be mentioned once more from a different angle. This will certainly shorten the time of execution of a project, but constitutes an unnecessary drain on the foreign currency resources of the country. Rather than this extreme, it is better to supplement the locally-available civil engineering facilities with imported facilities and/or

materials. It is wise to estimate the equipment and materials required for civil engineering at the time of contracting for equipment and to procure from abroad, together with the plant equipment, certain civil engineering equipment and materials generally short in the country, e.g. steel bars for reinforced concrete or trucks. There are many cases in the country where an extra expenditure of foreign currency of the order of 5 per cent, e.g. for buying piling machinery would by far reduce the time of execution of a project, and thus save on the unproductive delay in the utilization of imported plant equipment.

What applies to civil engineering applies equally to civil engineering design. It is faster and easier to have the civil engineering design executed by the main contractor for equipment. The shortcomings are a heavier expenditure in foreign currency, designs difficult to execute due to local conditions, and above all, neglecting the building-up of design experiences in the country. It is perhaps wiser, though more difficult, to obtain experienced technical assistance for civil engineering design. This can take two ways: deputing of civil engineering designers from abroad to direct the civil engineering carried out locally, and training some of the local civil engineers abroad.

Much trouble is encountered in a developing country in preparatory steps preceding erection, namely transport, sorting and storing of equipment. There is a real "know-how" in this connexion, and whenever this experience is lacking, it is wise to call in limited foreign technical assistance at that phase of work.

The same line of thinking can be extrapolated to mechanical erection. Instead of turn-key basis, it is wise to import erection equipment with each plant and to obtain only the necessary foreign supervisors of erection from the contractor. Much has been said on the wastefulness of buying erection equipment for each plant. However, in a developing country, erection equipment is a real wealth, and it will always find a good use in the economy.

There are several practices for erection, assuming that foreign supervision only is brought in. In general if a project is being implemented by a newly-formed company or concern, it is imperative to entrust erection to a contractor (local in this case). Only very well-established firms can afford to carry out erection with their own staff.

The schedule of execution in a developing country should always allow for an overlap between civil engineering work and erection. Although this may involve some additional difficulties in erection, it is the only realistic way of minimizing over-all time of execution.

A very serious problem in preparing a schedule is to make sure that utilities and facilities (such as transport) will be available at the time the plant is started up. Although this is a problem of national planning, it should be considered in the cse of each individual project, and some temporary solution must be found in case utilities or facilities from national sources cannot be obtained.

V. Problems related to Personnel

A very serious problem faces developing countries in the recruitment of personnel for project implementation. The importance of correct and timely choice of the project manager cannot be overstressed. Indeed this is as important as correct choice and procurement of equipment.

In a developing country two problems are faced in this respect: there is a real shortage of trained, experienced technical personnel, and furthermore, there is a maldistribution of such personnel in various sectors of industry. This can only be overcome by a systematic exploration of personnel fit for project management and leadership, and systematic training of such personnel. It is conceivable to find a person with the necessary qualities for leadership, but lacking, for example, in erection experience. He can well be trained on an erection job proceeding anywhere in the country in anticipation of his taking over a project management post in the future. This whole matter should be carefully planned, and any schedule of execution of an industrial plan should be accompanied at least by a schedule of selection and training of the project managers.

It is not intended here to enumerate the functions of a project manager. However, it must be pointed out that a project manager should devote his full time to the project at a very early stage.

Furthermore, a project manager should be given a free hand in the choice of his associates. Only too often has a project manager been placed with subordinates who are unable to co-operate with, and this has led to calamities. Harmony and team-work between all the staff of a project should be given priority even over technical skill or excellence. The human relation qualities of a project manager should be a leading factor in his choice.

It is the duty of a project manager to plan the recruitment and training of his staff. If he devotes his full time to the project at an early date before erection responsibilities become overwhelming, he

can find the time for correct planning and selection of his staff. Again in a developing country, staff with insufficient experience will have to be made use of. This can be counter-balanced by planned training. Ideally, suppose a new fertilizer plant is being set up in a new locality in the country, it would be advantageous to recruit new inexperienced staff into an existing fertilizer plant and gradually draw some of the more experienced staff from the existing plant to the new plant. This, however, would require complete co-operation between the parties concerned. If this is lacking, it would not be a waste to recruit new staff and place them in the existing plant for a period of up to two years and finally employ them in the operation of the new plant. This type of training is intended to complement various vocational training attempts, which alone cannot serve the purpose of forming sufficiently-capable personnel to construct and direct the project.

VI. Problems related to Financing

The key to timely financing of a project is accurate budgeting, which in turn is dependent on accurate scheduling.

In a developing country, almost always there is a real shortage of foreign currency. Once foreign currency is allocated to a project, all the resources must be geared to make maximum use of the foreign currency allocation. If, for example, foreign currency has been allocated to a project for effecting downpayments on equipment, there should automatically be sufficient funds for civil and other work to enable the installation of equipment in the shortest possible time. This, of course, is directly related to the question of priorities.

One point of interest is the necessity of having a certain contingency fund for each project, particularly in foreign currency to enable the removal of bottlenecks in erection or start-up resulting from the necessity to supply extra equipment, utilities for example, which may not have been foreseen at the time of contracting.

VII. Control and Reporting

Control of project implementation and factual reporting of progress are necessities which are unfortunately lacking in developing countries. Sometimes this is done on the basis of reporting the investment realized in a given time and comparing this to the total investment of the project. This, however, can be very misleading, since unnecessary expenditures would appear as definite progress in this form of reporting.

Many other firms of reporting have been tried, but the tendency is to always show things in a brighter picture than they really are.

Whatever method of reporting is followed, it should be done in an objective way, and preferably on-the-spot reporting by some neutral body other than the body executing the project. This is probably the only way to ensure unbiased factual reporting. There is much to be desired in this field, and developing countries should consider it in a very serious way. There is room for receiving foreign technical assistance in this respect.

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